logical Gardens are fed with their usual meal of small fishes.

The Darters usually exhibited in the Society's Gardens are of the South American species (*Plotus anhinga*), which, it seem, is the most easily obtained alive. But in 1878 an example of the African form Le Vaillant's Darter (*Plotus levaillanti*)[1] was received, and lived for some time in the Gardens, where it exhibited the characteristic mode of feeding previously observed in its American brother. In April last an example of a third species of this genus—the Indian Darter (*Plotus melangaster*) was obtained in exchange from the Zoological Gardens of Calcutta. After living for many months in excellent health this bird died suddenly on the 21st of December last, apparently from a sudden shock produced by feeding too rapidly.

In captivity the Indian Darter does not deviate as regards habits from the species previously received. "In a state of nature," as Dr. Jerden tells us, "this beautiful diver is found throughout all India, Ceylon, Burmah, and Malayana. It is exceedingly numerous in some parts of the country, especially in Bengal; hundreds are often to be seen on a single jheel. They hunt singly in general, or in scattered parties, but often roost in company, both at night and in the middle of the day, when numbers may be seen perched on the trees overhanging some tank or river. They float low on the water, often with nothing but the head and neck visible, and swim and dive with rapidity. After feeding for some time they perch on the bough of a tree or on a pole or stone, and spread their wings out to dry as the Cormorants do."

The Darters present some very abnormal features in the structure of the stomach and in the mechanism of the vertebræ of the neck. These have been elaborately described by the late Prof. Garrod from the specimens that have lived in the Society's Collection (*Proc. Zool. Soc.*, 1876, p. 335, and 1878, p. 679.

THE LICK OBSERVATORY

AN esteemed American correspondent has sent us the following information on this remarkable observatory:—

In December, 1874, Mr. James Lick determined to erect "the most powerful telescope in the world," somewhere within the boundaries of California, his adopted State. Various sites were proposed and considered, the first being Observatory Point on Lake Tahoe, which was soon abandoned on account of the severity of the winters at this place, and especially on account of the great snowfall. Mr. Lick's original idea was somewhat crude and unformed, but it took shape after consultation by letter and otherwise with various men of science in the East and elsewhere, and also with gentlemen of scientific tastes in California. Monte Diablo (3856 feet high), Mount Helena (4343 feet high), and other points, were successively proposed and, after examination, rejected. Finally, Mr. Lick sent Capt. Fraser, his man of business, to examine Mount Hamilton (4440 feet), an easily accessible peak some thirteen miles east of San José, in Santa Clara County. The first examination was made by Capt. Fraser, in August, 1875.

In most respects this site was found to be satisfactory, but the chief objections to it were found to be important, if not vital. The cost of constructing a road to the summit would certainly be very great, and the summit itself was a sharp point of very hard trap rock. To make a level space here for the reception of the necessary buildings would be a serious matter. Finally, no water was known anywhere near the summit. The last objection was disposed of by the discovery of two springs, only 4300 feet distant from the summit and 300 feet below it. Mr. Lick then announced that if Santa Clara County would build a suitable road connecting San José with the top of the mountain, he would establish and suitably endow an observatory on Mount Hamilton. After various changes in his plans Mr. Lick made a deed of trust (dated September 21, 1875), which gave a very large amount of real and personal property to five trustees to be by them expended for various purposes. The observatory was provided for as follows:—The trustees were authorised to expend the sum of 700,000 dollars for the purchase of the necessary land and for putting up on that land "a powerful telescope, superior to and more powerful than any telescope ever yet made," with the necessary machinery, &c., "and also a suitable observatory connected therewith." As soon as these objects are satisfactorily accomplished the observatory is to be turned over to the Regents of the University of California, to become a department of the University, and any surplus left over after paying for the land and observatory is to be invested in safe bonds. The income from these bonds is to be devoted to "the maintenance of the said telescope and of the observatory connected therewith, and shall be made useful in promoting science."

A grant of land was obtained from the United States; the proposition of Mr. Lick to Santa Clara county was accepted, and the road to the top of Mount Hamilton was built during 1876. It was formally accepted by the Trustees in January 1877. It is now maintained by Santa Clara county as a county road, and it is quite likely that it will soon be extended by Alameda county over the range into the San Joaquin valley. Probably no more magnificent mountain road exists in the United States, when one considers all the circumstances of fine surrounding scenery, excellent road-bed, and commanding views. Some idea of the engineering difficulties overcome can be had from the cost of constructing this highway twenty-six miles into the heart of the mountains, and with a rise of 4000 feet in twenty-two miles. Such a project would appal the average county surveyor of New England, but it was here accomplished at the large cost of 78,000 dols.

The maximum grade is 6 feet 6 inches in 100 feet, or about 343 feet in the mile. Most of the road, however, is materially less steep than this. The first four miles is a fine level avenue, laid out in a perfectly straight line in the Santa Clara valley. The ascent of the foothills is then commenced, and the road begins a series of turnings and twistings which are of course necessary to keep the gradient low. Toward the end of the route the road winds round and round the mountain itself and overlooks one of the most picturesque of scenes: the valley of Santa Clara and the coast range to the west, a bit of the Pacific to the south-west, the Sierra Nevadas with countless ranges between, to the south-east the San Joaquin valley, and the Sierras beyond to the east, while to the north on clear days you plainly see Mount Shasta (14,000 feet) 175 miles away. The bay of San Francisco lies open before you, like a child's dissecting map, and at the end of it Tamalpais, the mountain near the entrance to the Golden Gate.

Mount Hamilton has, properly speaking, three summits. The east peak is 4440 feet, the middle peak is 4350 feet, and the third, the observatory peak (originally 4256 feet), has been cut down to a level surface just large enough to contain the neeessary buildings for the instruments. The dwelling-house and workshops are on a narrow saddle some 50 feet below the summit. To gain the level surface some 29 feet of rock has been removed from the peak; in all about 40,000 tons. A level site is thus provided, and this is perfectly accessible from San José. With a light waggon one may trot the horses all the way. The springs have also been connected with "the hill," as it is called by the inhabitants, by a good

[1] The discovery recently made by Canon Tristram of the occurrence of this Darter breeding in large colonies on the Lake of Antioch is very remarkable, he species not having been previously known to occur north of Sennaar.

road along which a water-pipe is laid. These springs yield 850 gallons per day in the dryest time, and in the wet season as much as 5000 gallons per day. Thus a very serious problem is solved.

The decision of the general plans for the Observatory has fallen largely to the President of the Lick Trustees, Capt. R. S. Floyd. He has given to these questions an amount of time which few persons could possibly bestow on a matter outside of ordinary professional life. Since 1876 he has personally visited most of the observatories of Europe and America and has corresponded with astronomers all over the world. In 1879 he visited Washington, and together with Profs. Newcomb and Holden, of the Naval Observatory, he prepared a series of drawings from which the Observatory was to be built, and ordered the first of the instruments. The general plan of the Observatory is to give the place of honour to the large dome (some seventy-five feet in diameter). This is to contain a refracting telescope by Alvan Clark and Sons, of Cambridgeport, who have made not only the largest, but the best telescopes in the world. Their first telescopes were six inches in aperture and of exquisite definition. Without losing in precision, they have successively made object glasses of 8¼, 9⅛, 12, 15½, 18½, 23, and 26 inches. They are now engaged on an objective of 30 inches for the Russian Government, and will soon commence the Lick telescope of 36 inches aperture, for which they have served so magnificent an apprenticeship. This is to occupy the whole of the south end of the plateau of the summit. At the northwest corner stands a dome (completed in November, 1881) which contains a 12-inch telescope by Alvan Clark, one of his very finest. Connecting the two domes is to be a one-story building containing a clock room, workshops, a library, offices and bedrooms for observers. A transit house of iron (completed in 1881) stands a few feet east of the smaller dome, and just south of this is the photo-heliograph, with its house. A few feet east of this the six-inch meridian circle (by Repsold of Hamburg) is to stand, which, with the four-inch transit (by Fauth of Washington) completes the list of meridian instruments. A four-inch comet-seeker, by Clark, occupies a small dome. The main building will be built of brick. The bricks of clay, found close to the Observatory, are made under a contract which saves the Observatory some fifty per cent. of the usual cost. About 2,000,000 bricks are now made and ready to deliver, and these will just about suffice for the constructions agreed upon.

It will be seen that an observing station of importance is already established on the mountain, containing an equipment of which many European observatories would be proud. It may be said that the whole of the fund expended to date is less than the cost of the road to the summit, and this includes all expenses. This equipment has recently been utilised in the observation of the transit of Mercury on November 7, 1881, by Prof. Holden and Mr. Burnham, who were invited by the trustees to set up their first instruments. In 1879 Mr. Burnham spent three of the summer months on the mountain, and used his six-inch telescope in regular observations, the object being to compare the conditions of vision at this high altitude with those at lower levels. His conclusions were extremely favourable to the Mount Hamilton site, and from his report there is little doubt that during the summer months this site is more favourable than that of any observatory now established. During the winter, storms prevail, but the snow is not very deep, and does not lie long, and the temperature is not very low. When it is clear, in the rainy season, it is perfectly so, and the vision compares favourably with the average conditions at Eastern observatories. It is obvious that if the management of the Observatory affairs remains in the same able control, we shall have in a few years one of the most admirably equipped observatories in the world, on a site far superior to any; and without being too sanguine, it will be safe to expect much from such an institution in proper hands.

NOTES

MR. MACLEOD (Assistant Secretary, Education Department, Whitehall) having resigned, will be succeeded by Col. Donnelly, R.E., now Director of the Science Division, who, while retaining his present post, will, as Assistant Secretary of the Education Department, be the chief officer of the Science and Art Department at South Kensington.

THE death is announced of Prof. Theodore Schwann of Liége, the eminent biologist, at the age of seventy-two years. We hope to refer to Prof. Schwann at length next week. We also learn of the death of Hermann Schlagintweit, well known as a naturalist, and in conjunction with his brother Emil, as an explorer of the Himalayas.

THE death is announced of Signor Carlo Piaggia, who has done some good exploring work in the region to the south of Abyssinia. Signor Piaggia was proceeding from Khartoum to Fadassi to join Herr Shuver, to whose journey we referred last week.

WE regret to learn that Mr. Joseph Thomson is daily expected home. It may be remembered that he was engaged for two years by the Sultan of Zanzibar to geologise along the Rovuma, and in other districts of the Sultan's dominions. We give elsewhere some of the results of his great excursion along the Rovuma, where he failed to find coal, which the Sultan was anxious he should do. We are informed that the Sultan is so disappointed at the result that he has abruptly broken the engagement, and sent Mr. Thomson home with payment only for the time he has been out. This is disappointing, as much good work would certainly have been done by Mr. Thomson had he been allowed to pursue his explorations. Evidently the Sultan has much to learn. We trust Mr. Thomson will soon find suitable employment for his exceptional ability as an explorer.

SOME very important experiments have recently been carried out at the Conservatoire des Arts et Métiers, upon the accumulating power of Faure's secondary battery. A committee consisting of MM. Tresca, Potier, Joubert, and Allard conducted operations. Thirty-five accumulators of the spiral form, each set in a cylindrical stoneware pot about 35 centims. high and 25 centims. diameter, were charged in series by the current from a Siemens' dynamo-electric generator worked by a steam-engine. The working electromotive force of an accumulator was found to be from 2·15 to 2·5 volts. For twenty-two hours the battery was charged with a current whose average strength was 8·5 ampères, the total work expended in charging being 6,020,000 kilogrammetres. The total work of the steam-engine was also measured by a dynamometer, the Siemens' generator having, as it appeared, an efficiency of 71 per cent. The battery was then discharged through eleven Maxim lamps, the potential and current being accurately measured from time to time, and although the discharge lasted eleven hours there appeared to be 70 per cent. of the original energy given out in the discharge. A complete report is promised by the committee.

THE umbrella trade (according to the *Scientific American*) threatens the existence of the pimento (pepper) plantations of Jamaica. It was shown by an official estimate made at Kingston last autumn, that more than half a million umbrella sticks were then awaiting export to England and the United States. These sticks were almost without exception pimento, and it is not surprising that owners and lessees of pimento walks are becoming alarmed at the growth of a trade which threatens to uproot, in a